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<p>(54) Title: CONTROLLED COLOR RELEASE ACCENT COMPOUND AND PRODUCTS THEREFROM</p> <p>(57) Abstract</p> <p>A controlled color release accent compound according to the invention includes from about 20 to about 99 percent by weight of a polyphenylene oxide binder; and, from about 80 to about 1 percent by weight of a colorant component.</p>		

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CONTROLLED COLOR RELEASE ACCENT COMPOUND AND PRODUCTS THEREFROM

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TECHNICAL FIELD

The present invention is directed toward a controlled release accent compound for providing an extruded base material with an accent color. More particularly, the accent compound according to the invention is a blend of a binder component and a colorant, wherein the binder material controls the release of the colorant to the base material during extrusion thereof. Specifically, the binder component includes at least polyphenylene oxide.

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BACKGROUND OF THE INVENTION

It is known in the art to fabricate polymeric, i.e., plastic, materials having a multicolored appearance. For example, in the vinyl siding industry, much effort has been expended to prepare woodgrain appearing materials. Often, as in U.S. Pat. No. 5,387,381, a base material is extruded with an accent color producing material. The accent color imparts the woodgrain effect to the base material, such as by having a different heat deflection temperature from the base material.

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The accent color producing compounds and methods heretofore known in the art have been somewhat successful in preparing commercially acceptable products, and in fact, the demand for woodgrain-appearing vinyl siding continues to grow. However, these compounds and methods such as in the '381 patent, have also proven to be difficult to control during processing. It has been found that despite careful control of for example, heat deflection temperatures, precise control over the amount of accent coloring is difficult to maintain. Of course, without precise control over such coloring, the finished accented product will vary from batch to batch. This is severely commercially detrimental. A user finishing a project such as the siding of a building will normally demand to have a siding product having somewhat complete uniformity. Substantial variances in the amount of accent coloring, the distribution

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thereof or the like are normally unacceptable, except of course when such variances mimic natural variances in woodgrain patterns or the like.

A need exists therefore, for a controlled color release accent compound which will promote and enhance the release of a colorant to an extruded base material.

5 It has been unexpectedly found that a polyphenylene binder component according to the present invention, provides such controlled color release.

SUMMARY OF INVENTION

It is therefore, an object of the present invention to provide a color release
10 accent compound for use in imparting an accent color to an extruded base material.

It is another object of the invention to provide a compound as above, wherein use of the compound will impart an improved measure of control over the accent coloring.

It is a further object of the present invention to provide products having
15 an accent color.

It is yet another object of the invention to provide products as above, wherein the accent coloring control is improved.

These and other objects together with the advantages thereof over the existing art, which shall become apparent from the specification which follows, are
20 accomplished by the invention as hereinafter described and claimed.

In general, a controlled color release accent compound according to the invention comprises from about 20 to about 99 percent by weight of a polyphenylene oxide binder; and, from about 80 to about 1 percent by weight of a colorant component.

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PREFERRED EMBODIMENT FOR CARRYING OUT THE INVENTION

As will be apparent from the description to follow, the present invention provides an accent color compound, which when extruded with an extrudable base material, will impart a controlled amount of accent coloring thereto. The accent color
30 compound includes at least a polyphenylene oxide binder and a colorant component. The exact nature of the colorant component is not a limitation of the invention, and

will vary depending upon the amount of coloring desired, the type of base material being extruded and the like. Conventional colorants including pigments and the like are all within the scope of the invention. One preferred class of colorants includes the pigments conventionally used in vinyl siding extrusions.

5 The polyphenylene oxide (hereinafter referred to as "PPO") binder includes a PPO component, the colorant and optionally, one or more additional resins. Conventional processing aids, conditioners, extenders and the like can also be used and fall within the scope of the invention, although they will not be fully described herein. In addition, the PPO component itself may also be a blend of PPO and
10 another polymer, as will be discussed hereinbelow.

 A preferred accent color compound according to the present invention includes from about 20 to about 99 percent by weight of the polyphenylene oxide binder and from about 80 to about 1 percent by weight of the colorant component. A more preferred compound includes about 30 percent by weight of the colorant and
15 about 70 percent by weight of the PPO component or the PPO component and another resin.

 The PPO component, as stated above, may be a blend of PPO and another polymer, such as polystyrene, high impact polystyrene, polyamide, polymethyl methacrylate, acrylonitrile butadiene styrene, styrene acrylonitrile, polybutylene terephthalate, or the like. For example, a useful and commercially available
20 PPO/styrene blend is Noryl PX-1390 available from General Electric. The amount of PPO and other polymers used in the blend will vary depending upon the end use of the compound, and one skilled in the art will readily determine which if any such blends are useful. PPO can be used by itself as the PPO component, and neither it
25 nor the blend is necessarily more preferred.

 As was also stated hereinabove, the binder may also include one or more additional resins. It is preferred that these resins be selected from the group consisting of non-acrylic and non-polycarbonate addition- and condensation-type polymers, or copolymers or mixtures thereof, having at least a degree of weatherability.

30 Examples of useful addition-type polymers include acrylonitrile butadiene styrene; acrylic ester-modified styrene acrylonitrile; styrene acrylonitrile; acrylonitrile

ethylene styrene; acrylonitrile methacrylate; polystyrene; high impact polystyrene; polyvinylidene fluoride; chlorinated polyethylene, and copolymers and mixtures thereof.

Another way of classifying the useful addition-type resins is as those
5 polymers having repeating monomer units selected from the group consisting of acrylonitrile, butadiene and styrene, propylene, ethylene, methylmethacrylate, ethylacrylate, ethylmethacrylate, isoprene, vinyl chloride, vinylidene fluoride, vinyl acetate, 2-ethylhexylacrylate, maleic anhydride, methacrylic acid, and mixtures and
10 copolymers thereof. Examples include acrylonitrile butadiene styrene; acrylic ester-modified styrene acrylonitrile; styrene acrylonitrile; acrylonitrile ethylene styrene; methacrylonitrile butadiene styrene; acrylonitrile methacrylate; polystyrene; high impact polystyrene; polyvinylidene fluoride, chlorinated polyethylene, and copolymers and mixtures thereof. A preferred resin component is an acrylic ester-modified styrene acrylonitrile, or ASA. One useful commercially available ASA is Geloy 1020
15 from General Electric.

Examples of useful condensation-type polymers include polyester, polyamide, polyurethane, and copolymers and mixtures thereof.

A preferred amount of PPO component as compared to the resin component is from 100 to about 5 percent by weight of polyphenylene oxide
20 component and from 0 to about 95 percent by weight of resin component. One further preferred accent color compound includes 38.5 percent by weight of Noryl PX-1390, and 31.5 percent by weight of Geloy 1020.

It has been further unexpectedly found that when the resin component is used, and the viscosity thereof is different from the viscosity of the PPO component,
25 even further control over accent coloring is achieved. A preferred viscosity system has a PPO component having a higher viscosity than the resin component. As will be appreciated by those skilled in the art, viscosity is an arbitrary measurement, and therefore, will not be quantified herein. The quantified variance in viscosities is also not an absolute limitation of the invention, and will change depending upon the end
30 use of the inventive compounds.

The compounds according to the invention can be used with any extruded polymeric material to which it is desired to impart an accent color. An example of an extrusion process is found in U.S. Pat. No. 5,387,381 which is hereby incorporated by reference for such disclosure. No single extrusion process is a limitation of the invention beyond that the extruder has an inlet and an outlet. Preferably the extruder has ports between the inlet and the outlet, as is conventional.

Extrudable materials which can be accent colored according to the invention include without limitation, polyvinyl chloride, polyvinylidene fluoride, acrylonitrile ethylene styrene, acrylic ester-modified styrene acrylonitrile, acrylic, polycarbonate, chlorinated polyvinyl chloride, chlorinated polyethylene, and copolymers and mixtures thereof and the like. These materials are useful in preparing among others products, siding, decking, fencing, downspouts, gutters, skirting and the like for the building industry. When used with these materials, it is preferred to extrude from about 0.1 to about 99.9 percent by weight of an extrudable polymeric component with from about 99.9 to about 0.1 percent by weight of the controlled color release accent compound as described hereinabove.

The PPO binder component, with or without the additional resin component, is preferably formed into a fused pellet with the colorant and other processing materials if used, by conventional techniques. The pellet can be added to the extruded base material at any desired point between the inlet and the outlet to impart accent coloring to the extruded base material.

GENERAL EXPERIMENTAL

In order to demonstrate the practice of the present invention, a woodgrained colored vinyl siding product was prepared. The base material used was a ten parts per hundred titanium dioxide polyvinyl chloride capstock composition. The base material was extruded using a 40 millimeter conical, twin-screw extruder. This extruder has an inlet hopper leading to a barrel, a vent into the barrel and an outlet die head assembly.

A controlled color release accent compound was prepared according to the invention, and included 38.5 percent by weight of Noryl PX 1390, 31.5 percent by

weight of Geloy 1020, and 30.0 percent by weight of a pigment known and commercially available as Shepard Brown 221. Using a Computrac TMX, the sample was shown to have a moisture content of 0.045 percent by weight.

5 The accent compound was introduced into the vent of the extruder barrel, and the base and accent color were extruded at 185°C. The extruder was set to rotate at from 1100 to 1300 rotations per minute. The resulting extruded product showed excellent streaking and a good woodgrained appearance. As a control, a sample product according to U.S. Pat. No. 5,387,381 was also prepared. The amount of streaking between the control and the inventive products was substantially similar.
10 However, it was found that the results of the invention were easily repeatable while those of the control sample were difficult to reproduce with consistency.

It is to be understood that the invention is not limited to the specific components as recited herein, except as is otherwise stated in the specification. Similarly, the example has been provided merely to demonstrate practice of the subject
15 invention and does not constitute limitations of the invention. Those skilled in the art may readily select other components and process conditions, according to the disclosure made hereinabove.

Thus, it is believed that any of the variables disclosed herein can readily be determined and controlled without departing from the scope of the invention herein
20 disclosed and described. Moreover, the scope of the invention shall include all modifications and variations that fall within the scope of the attached claims.

CLAIMS

What is claimed is:

- 1 1. A controlled color release accent compound comprising: from about 20 to
2 about 99 percent by weight of a polyphenylene oxide binder; and, from about
3 80 to about 1 percent by weight of a colorant component.
- 1 2. A compound as set forth in claim 1, wherein said polyphenylene oxide binder
2 is a blend of from 100 to about 5 percent by weight of polyphenylene oxide
3 component and from 0 to about 95 percent by weight of a resin component.
- 1 3. A compound as set forth in claim 2, wherein said resin component comprises
2 at least one polymer selected from the group consisting of acrylonitrile
3 butadiene styrene; acrylic ester-modified styrene acrylonitrile; styrene
4 acrylonitrile; acrylonitrile ethylene styrene; methacrylonitrile butadiene styrene;
5 acrylonitrile methacrylate; polystyrene; high impact polystyrene; polyester;
6 polyamide; polyurethane; polymethyl methacrylate; polybutylene terephthalate;
7 polyvinylidene fluoride; and, chlorinated polyethylene.
- 1 4. A compound as set forth in claim 2, wherein said resin component comprises
2 at least one polymer having repeating monomer units selected from the group
3 consisting of acrylonitrile, butadiene, styrene, propylene, ethylene,
4 methylmethacrylate, ethylacrylate, ethylmethacrylate, isoprene, vinyl chloride,
5 vinylidene fluoride, vinyl acetate, 2-ethylhexylacrylate, maleic anhydride, and
6 methacrylic acid.
- 1 5. A compound as set forth in any of claims 2 through 4, wherein said
2 polyphenylene oxide and said resin component have different viscosities.
- 1 6. A compound as set forth in claim 5, wherein said polyphenylene oxide has a
2 higher viscosity than the resin component.

- 1 7. An extruded polymeric product comprising an extrudable polymeric base
2 material and the controlled color release accent compound of any of claims 1
3 through 6.

- 1 8. An extruded product as set forth in claim 7, wherein said polymeric base
2 material comprises at least one polymer selected from the group consisting of
3 polyvinyl chloride, polyvinylidene fluoride, acrylonitrile ethylene styrene,
4 acrylic ester-modified styrene acrylonitrile, acrylic, polycarbonate, chlorinated
5 polyvinyl chloride, and chlorinated polyethylene.

- 1 9. An extruded product as set forth in claim 7 or 8, formed by extruding said base
2 material and said accent compound in an extruder having an inlet and an
3 outlet, wherein said accent compound is added to the extruder at a point
4 between and including said inlet and said outlet of said extruder.

- 1 10. A method of preparing the extruded polymeric product of any claims 7 through
2 9 comprising: extruding from about 0.1 to about 99.9 percent by weight of the
3 extrudable polymeric component with from about 99.9 to about 0.1 percent by
4 weight of the controlled color release accent compound.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/12165

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :C08J 3/20; C08L 71/10, 71/12

US CL :524/ 501, 502, 513, 515, 516, 565, 566, 611, 876

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 524/ 501, 502, 513, 515, 516, 565, 566, 611, 876

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,223,577 A (BAUMGARTNER ET AL.) 29 June 1993, column 2, lines 29-45; column 3, lines 40-44; column 5, lines 1-31.	1-6
Y	US 5,153,266 A (MUEHLBACH ET AL.) 06 October 1992, column 1, lines 36-40; column 3, lines 15-22; column 4, lines 62-68; column 5, lines 14-25; column 6, lines 58-68.	1-6
Y	US 5,232,751 A (CAMERON ET AL.) 03 August 1993, column 1, lines 55-68; column 3, lines 19-68; column 5, lines 34-36.	1-6
Y	US 4,948, 832 A (OSTERMAYER ET AL.) 14 August 1990, column 1, lines 6-24; column 2, lines 36-68; column 3, lines 25-37.	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

02 SEPTEMBER 1996

Date of mailing of the international search report

25 OCT 1996

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	REISCH, M.S. Plastics in Building and Construction. C & EN 30 May 1994, pages 20, 21, 22, 24, 41,42.	1-6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/12165

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 7-10
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.